Editorial

A Broader View

Last year the National Academy of Sciences' Committee on Science, Engineering, and Public Policy published a report titled "Reshaping the Graduate Education of Scientists and Engineers" (*1*). Since then, there has been general approval of the recommended changes, such as broadening the knowledge base of the student, expanding student support through educational or training grants, and improving the availability of career information.

A desire to broaden the perspectives of scientists is not a new theme; recently, however, the idea has received more attention with the objective of improving scientific research and the employability of our new graduates. In an effort to address this perceived need, interdisciplinary meetings known as the Scientist to Scientist colloquia were inaugurated by the Keystone Center in 1991. The meetings were begun with the intention of promoting the appreciation of the diversity of scientific fields, the sheer pleasure of learning for learning's sake, and the ability of scientists to communicate the interest and excitement of their work in an accessible fashion. In a symposium held at the 210th American Chemical Society's National Meeting in 1995, Janet Osteryoung of the National Science Foundation's Division of Chemistry listed several areas that cried for integration of disciplines such as molecular recognition, molecular electronics, and the health and environmental sciences. To prepare the student for employment outside of academe, the National Science Foundation has in place a program titled Grant Opportunities for Academic Liaison with Industry.

Editorials, including those by Madeleine Jacobs of *Chemical and Engineering News* (*2*), Deborah Barnes of *The Journal of NIH Research* (*3*), and Floyd Bloom of *Science* (*4*), have examined the importance of a wide knowledge base in improving scientific research and the employability of scientists. A lively debate was generated by the National Academy of Sciences report in the Letters sections of several journals. In one of these letters, William J. Schulz (*5*) wrote

> When I look around me and consider why some of my colleagues have been more successful than others, even if all have comparable technical capabilities, the answer is obvious. People who can relate to things other than their field of expertise—for example, the business environment, customers, economics—are the people who can leverage their expertise more successfully.

Christian de Duve, in his book *Vital Dust: Life as a Cosmic Imperative* (*6*), states that "active science narrows the mind more often than it broadens it, the reason being the increased specialization of facts, concepts, and techniques. As we dig deeper our scope shrinks."

A narrow focus may be more the rule than the exception, despite the fact that the more people can expand their knowledge base, the greater their potential for contributing to science. A clear example of this potential for innovation was noted in a fascinating article that appeared in *Scientific American* (*7*). Author James Burke weaves a story about the complex, serendipitous interconnectivity of events that can lead to great discoveries. His example starts with an observation by Antonie Thonisoon (who later changed his name to van Leeuwenhoek) of drawings of shot silk (a fine, iridescent, and expensive weave). Fascinated with the idea of viewing materials in finer detail, Leeuwenhoek developed powerful magnifying lenses. In a circuitous route, one discovery led indirectly and incredibly to another, including the first observation of microorganisms, the relationship of electricity to light, the development of the telegraph, the development of Nobel's underwater mines, the establishment of weather forecasting, the use of vacuum valves to automate calculations, the first electronic calculator, and finally a discovery that went directly back to shot silk, the use of punched cards to feed data into a computer. The punch card idea came, strangely enough, from the use of similar cards to automate the production of cloth made of a material too expensive to make mistakes with—shot silk.

The importance of a broader perspective for scientists is recognized in the publication field as well. *Science* and *Nature* epitomize the presentation of information from all fields of scientific endeavor. *Nature Medicine*, in its guide to authors, states that "as biomedical science necessarily becomes more specialized, it is essential that there is a journal that will provide readers with clear access to the advances and achievements of disciplines other than their own."

In the same spirit, we at *Environmental Health Perspectives* try to provide information that will facilitate cross-fertilization between scientific disciplines. We do this in the belief that it is critical to our understanding of the impact of the environment on human health.

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References

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